



Robotics Current Issues and Trends

Siti Nurmaini

Computer Engineering Department, Computer Science Faculty, Sriwijaya University

ABSTRAKSI

Penelitian yang sedang berlangsung dan pengembangan di bidang robotika telah mengakibatkan begitu banyak tren teknologi baru. Ada revolusi yang sedang dicapai dengan penggunaan teknologi terbaru dalam robotika, melahirkan kemungkinan baru untuk mengotomatisasi tugas-tugas dan memperkaya kehidupan manusia yang lebih baik. Hal ini dapat dengan mudah menyaksikan kehadiran robotika dalam setiap bidang kehidupan dari robot industri, robot layanan sampai robot pribadi. Ini kata lain, robot telah menjadi bagian dari dunia kita untuk memenuhi tuntutan baru dari masyarakat baru.

Kata Kunci: Robot

ABSTRACT

The ongoing research and development work in the field of robotics have resulted in so many new technological trends. There are revolution which are being achieved with the use of latest technology in robotics, giving birth to new possibilities for automating tasks and enriching human lives for better. One can easily witness the presence of robotics in every sphere of life from industrial robots, service robots to personal robots. In other words, robots have become a part of our world to meet new demands of a new society.

Keywords: Robot

Nowadays, robotics is fast growing field for many applications. Over the past decade, the first automatic equipment in industry with pre-programmable operating system to perform motion and control functions in production process, which replace analogical functions of human in manipulation and technological operations. Industrial robots, especially manipulators robot have been widely deployed in factories for tedious, repetitive, and dangerous tasks, such as assembly, painting, packaging, and welding [1]. These robots have been very successful in such applications, because of their high endurance, speed, and precision in structured factory environments [1].

In the beginning of the 90's a new generation of mobile, intelligent, and cooperative robots is developed in construction, agriculture, food industry, household, medical and rehabilitation, entertainment industry as well as for leisure and hobby [2,3,4]. As robots migrated out of the fixed automation, fully structured factory assembly lines into unpredictable environment of space, underwater, air and on the ground. It became clear that a complementary range of sensors and considerable artificial intelligence technique would be needed to achieve autonomy. With such

improvement, the composition of robots is becoming increasingly complex. New sensing and actuation devices are being developed and new methods and algorithms for functional elements are being proposed every year.

Currently, the developing trends are robots supporting human in everyday life [5], such as cooperative robots, bio-inspired robots, ubiquitous robots and cloud robots [5,6]. Robots have changed our daily life the same way as mobile phones and laptops. In addition modern information technologies lead to loneliness of the humans (tele-working, tele-banking, tele-shopping, and others) [7]. The robot systems of the next decades will thus be human assistants, helping people do what they want to do in a natural and intuitive manner. These assistants will include: co-workers in the workplace robot, assistants for service professionals robot, companions in the home robot, servants and playmates robot, security robot and space robot [8]. Therefore such robots will become a real “partner” of humans in the nearest future.

However, robotic systems present some challenges due to differences in their physical capabilities, sensor configuration, and hardware control architectures [9]. The major challenge comes from environmental variability. Consider the example intelligent mobile robot system, the challenge is perception about the dynamic changing environment. Hence, the informationS of the robot’s position, obstacles, objects and interaction with the environments are required to perform actions autonomously. Coping with the environmental variability could only be accomplished with sensor feedback, the accurate sensors with high reliability are the basis for this intelligent robots design. Leading to what was known as the third robot generation. It soon become apparent that higher degrees of intelligence is needed to accommodate variability and uncertainty.

To enlarge the functional range or to deploy them in unpredictable environments, several robotics system are integrated with network technologies, named networked robots. It refers to a group of robotic devices that are connected via wireless communication network [8,9]. It has potential to improve performance in at least five ways: 1. indexing a global library of images, maps, and object data; 2. parallel grid computing on demand for statistical analysis, learning, and motion planning; 3. humans sharing code, data, algorithms, and hardware designs; 4. robots sharing trajectories, control policies, and outcomes; and 5. offline and on-demand human guidance for evaluation, learning, and error recovery [10]. The cooperation of networked robots with various abilities could make new service jointly available. To foster the emergence of networked robotics through the concept of cloud robotics, leading to more intelligent, efficient and yet low cost robotic networks [10,11,12].

The future for robots being used at various levels of autonomy in many everyday activities is likely to be bright if one does not expect too much. Hence, it must be able to interact and work symbiotically with us and it will be used in all areas of modern life. With recent advances in robotic technologies and integrated multi-robot systems, robots will acquire richer functionalities and the systems will become much easier to develop. The robot’s role in the future could be improved by embedding them into emerging information technology environments [12].

It is characterized by a growing spread of ubiquitous computing and communications and ad-hoc networks of sensors forming that has been termed as “ambient intelligence”. In this case, the robotic technologies combine with ubiquitous network and cloud-computing infrastructure that connects multiple robots, sensors, portable devices and data-center. It is an attractive model, since it allows the provision of resource retrieval and allocation. It is common that computational resources are allocated to distributed clients and resource allocation system is regarded as a mechanism that aims to fulfill any requirements of target applications.

When robots become more and more part of daily life, legal questions of their interactions with humans and their consequences have to be addressed. The challenges will be now humans and robots can work together cooperatively with a reliable communication, safety and reliability. This opens a new paradigm in robotics that we believe leads to exciting future developments. It allows the deployment of inexpensive robots with low computation power and memory requirements by leveraging on the communications network and the elastic computing resources offered by the cloud infrastructure [12,13,14].

Numerous other challenges remain in the development of personal robotic design such as, dealing with measurement uncertainties; dealing with human activity; dealing with differences in data flow models among platforms; dealing with multiple clients; supporting real-time operations; addressing abstract time for real and simulated platforms; and addressing distributed computation. Therefore the research question for answering such challenges be concluded as:

- How to develop robotic systems with sense and interaction with human ability?
- How to design robotic systems that have ability to perform complex tasks with a high degree of autonomy ?
- How to improve the quality, robustness, smaller size and reduced the computational power ?
- How to improve in mechanisms for robot platforms in terms of weight, strength, and capability ?

In the future, robots development is bright. But, how will robots technology today, affect future generations? Sometimes you can get ideas for the future by looking into the past and thinking about the changes we've seen as a result of other great inventions. One of scientists dream is everyone should have at least one of ‘personal robot’ with price equal to personal computer. Perhaps one day we will have true robotic “helpers” for serving humans to make life easier.

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